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September 30, 2015

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From: Sachi A. Hamai
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INITIAL RESULTS FROM THE ELP-HMIS DATA INTEGRATION PROJECT

This memo provides the Board of Supervisors with a completed report on the initial results from the Enterprise Linkages Project (ELP)-Homeless Management Information System (HMIS) Data Integration Project. The first phase of the project was initiated in response to the growing interest within County agencies in obtaining more systematic information on their homeless clients. The report is based on collaborative work that the Chief Executive Office's (CEO's) Research and Evaluation Services unit (RES) performed with the Los Angeles Homeless Services Authority (LAHSA) and Abt Associates in conducting de-identified data matches linking clients in HMIS to records of County service use in the ELP data warehouse. The formal protocols governing the matches were established in a Memorandum of Understanding (MOU) between the CEO and LAHSA, and the work performed to link the data and examine utilization patterns was funded by the Conrad N. Hilton Foundation. The resulting analysis reveals aggregate patterns of County service use among close to 120,000 persons who also received services through LAHSA between 2010 and 2013. The findings, which include analyses of various homeless subgroups, are summarized in the attached report and provide the basis for further efforts to systematically integrate records across ELP and HMIS.

The Objective of the First Phase of the ELP-HMIS Project

The objective of the first phase in the ELP-HMIS project was to explore the technical feasibility and potential value of integrating and analyzing data across service delivery systems and boundaries of governance. RES, LAHSA and Abt worked jointly to match four years of de-identified LAHSA clients to de-identified records of services provided over the same period through the County departments of Health Services (DHS), Mental Health

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(DMH), Public Health (DPH), Public Social Services (DPSS), and the Sheriff. Three questions guided the examination of the match results:

1) Can service records in ELP be reliably linked to service records in HMIS?

No major technical issues were encountered in linking HMIS data to County service records in ELP. From the standpoint of data compatibility, the exploratory data matches demonstrate that a permanent integration of de-identified data across the two systems would be relatively uncomplicated given the necessary resources and the establishment of a legal framework that would permit routinely-updated data sharing between the County and LAHSA.

2) Do the linked data show significant overlaps in the LAHSA and Los Angeles County client populations?

LAHSA served roughly 55,000 clients per year from 2010 through 2013. As expected, the matches linking these clients to data in ELP showed significant use of County services, both annually and over the four-year observation period as a whole:

- DHS served 47 percent of the unique clients who received services through LAHSA between 2010 and 2013. These patients consumed almost 380,000 DHS services over this period.

- DMH provided treatment to at least 15 percent of the LAHSA client population over the four-year observation period, accounting for close to 765,000 of the mental services captured in ELP (which are not exhaustive).

- DPH's Substance Abuse Prevention and Control (SAPC) program treated close to 10 percent of the clients served by LAHSA over four years, providing these persons with almost 22,000 services.

- The Sheriff's Department arrested roughly 17 percent of the persons in LAHSA's client population between 2010 and 2013. These persons experienced 106,951 stays in County jail facilities over four years.

- DPSS initiated new periods of General Relief (GR) receipt for roughly 15 percent of the persons in LAHSA's four-year client population.

3) Do the results of the analysis suggest that conducting further matches between ELP and HMIS would enhance the design and planning of homeless-related programs and services?

The first phase of the ELP-HMIS project demonstrated that data linked across the two systems could inform and enhance efforts to maximize the effectiveness and cost-efficiency of resources devoted to reducing homelessness in Los Angeles County. Some preliminary test analyses were conducted to demonstrate the types of information that would be made available through ongoing data matches in the near term, as well as through a systematic and permanent integration of the records in the two systems over the long term.

Findings on Service Use within Subgroups of the LAHSA Population

The data match results enabled an examination of County service use among subgroups within the four-year LAHSA client population. Among the key results of this analysis are the following:

- Roughly 85 percent of LAHSA's four-year client population (100,452 of 118,626) was at least 18 years of age when they initiated their engagement with LAHSA

- Almost three-quarters of these adults were *single* adults (74,477 of 100,452), and they comprise 63 percent of the 118,626 clients in the four years of HMIS records examined for this project.

- Close to three-quarters of the adults who received services through LAHSA between 2010 and 2013 (72,971 of 100,452) also used services through at least one of the five County agencies included in the data matches over this period. Moreover, 83 percent of the *single* adults LAHSA served over four years (61,649 of 74,477) used services through at least one of the five County agencies.

- In 2013, roughly 27 percent of the adults LAHSA served (11,815 of 54,168) were categorized in HMIS as *chronically homeless* in at least one of their HMIS service records for the year. These clients constituted about 22 percent of the 54,168 clients LAHSA served overall during the year.

  o DHS served half this subgroup of chronically homeless adults during 2013 (n=5,879).

  o DMH served at least 17 percent of the chronically homeless adult subgroup during 2013, though the number is likely higher (n=1,958).

  o DPH/SAPC served close to 7 percent of the chronically adult subgroup in 2013 (n=804)

- o DPSS initiated new periods of GR receipt for roughly 16 percent of the chronically homeless adult subgroup in 2013 (*n*=1,832). However, this does not capture persons whose time on GR began before 2013 and then continued uninterrupted thereafter.

- o The Sheriff's Department arrested 11 percent of the chronically homeless adult subgroup in 2013 (*n*=1,302). Roughly 92 percent of these arrested clients (*n*=1,192) were held in a County jail facility, and 26 percent (*n*=340) were arrested more than once during the year.

Analysis of the Timing of Service Episodes

County and LAHSA service dates were linked across ELP and HMIS and provided an opportunity to examine the timing of County service episodes in relation to housing placement dates. Analysis at this level revealed the following:

- Two-thirds of the of the DHS services used by the four-year LAHSA study group - including Emergency Room visits and inpatient hospitalizations - took place in years when clients were not receiving services through LAHSA.

- Similarly, 57 percent of the group's observed jail stays and 42 percent of the group's DPH/SAPC service episodes between 2010 and 2013 occurred in individual years when clients were not engaged with LAHSA.

- The match results were also used to show the extent to which analysis of linked data could produce more specific information on the timing and interaction of service episodes. The primary purpose of these tests was to *formally* demonstrate the analytic capacities that would be available with data integrated across ELP and HMIS. However, caution must be exercised in assessing the policy implications of the results since the tests did not control for unequal pre/post periods of observation.

  - o Among the 7,399 LAHSA clients over the four-year observation period who were placed in Permanent Supportive Housing (PSH) projects, Emergency Room visits declined from 5,423 before placement to 4,834 afterwards, a decrease of 11 percent. However, this likely understates the extent of the decline among the PSH subgroup since the mean amount of time observed after their placement in housing was three times longer than the mean amount of time before placement.

  - o Among the same group of LAHSA clients, inpatient hospitalizations increased by 16 percent, from 886 before placement into PSH to 1,029 afterwards, and consumption of DHS outpatient services increased by roughly 42 percent, from 15,403 before placement to 21,901 afterwards. However, this likely overstates

the increases in utilization since the mean amount of time observed after placement was about 3.5 times longer than the amount of time observed before placement among patients in the PSH subgroup who used inpatient and/or outpatient services.

It is important to note that conducting time-sensitive analysis for purposes other than demonstration would require the use of more sophisticated time-to-event statistical methods that control for uneven periods of observation.

Examining High-Volume Users of County Services

The ELP-HMIS data match results additionally enabled an analysis of high-volume users of County services. For testing purposes, LAHSA clients using five or more services in a year (2 or more for DPH SAPC services), or 20 services in four years, were categorized as high-volume service users in analyzing the linked data:

- More than 40 percent of the LAHSA clients who engaged with DMH over four years were heavy users of the department's services, though recurrent forms of outpatient treatment account for almost all of this utilization.

- Of the 19,695 persons in the LAHSA study group who were arrested between 2010 and 2013, 6,523 were arrested at least 20 times over these four years.

- Slightly more than 7 percent of the DHS patients in the study group were heavy utilizers of the department's services over four years.

- Although less than 1 percent of the DPH SAPC patients in the study group were heavy utilizers in definitional terms, this comparatively low proportion is partially a reflection of the extended (as opposed to repetitive) manner in which SAPC services are provided.

Next Steps

The initial ELP-HMIS data matches and resulting analyses suggest that building an infrastructure for integrated and routinely-updated data on Los Angeles County's homeless population would provide a valuable asset in the development of effective and cost-efficient interventions in homelessness. RES, LAHSA, and other stakeholders will continue to collaborate in building on the Phase I results. The immediate next steps are as follows:

- The existing data sharing MOU between the CEO and LAHSA is valid through 2019. Under the terms of the agreement, LAHSA will make de-identified HMIS data files available to RES on a quarterly basis for purposes of analysis and program

evaluation. In turn – and provided the County agencies participating in ELP raise no objections – RES will prepare biannual reports on patterns of County service utilization among clients with records in HMIS. These reports will be shared with LAHSA and the County agencies included in the matches, and their specific content will be determined collaboratively with ELP stakeholders. The first of these reports is expected to be submitted for review by LAHSA and all ELP stakeholders by the summer of 2016.

- The CEO will work with LAHSA to convene a meeting of the County agencies currently participating in ELP, including their County Counsels, as well as other stakeholders, for the purpose of building consensus on the permanent addition of LAHSA to the ELP master data sharing MOU and initiating the development of a Phase II project plan.

Please feel free to contact me if you have any questions or need additional information, or your staff may contact Cheri Thomas at (213) 974-4603, or via email at: cthomas@ceo.lacounty.gov.

SAH:JJ:CT
MS:km

Attachments

c: Sheriff
        Executive Office, Board of Supervisors
        County Counsel
        Health Services
        Mental Health
        Public Health
        Public Social Services
        Los Angeles Homeless Services Authority

Linking Data across the Homeless Management Information System and the Enterprise Linkages Project:

Results from a Series of Exploratory Data Matches

Conducted by

Los Angeles County
Chief Executive Office
Service Integration Branch,
Research and Evaluation Service

Los Angeles Homeless Services Authority

&

Abt Associates

September 2015

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Introduction and Objectives

Research from numerous counties, municipalities, and other localities across the United States, including Los Angeles, is remarkably consistent in showing that chronically-homeless men and women tend to be comparatively heavy consumers of public services, yet the lack of multidisciplinary data on these patterns of utilization has limited the ability policymakers have to craft effective programmatic interventions. However, data from both homeless and mainstream service delivery systems managed by Los Angeles County do exist and could be leveraged to inform local planning and program design.

Since 2009, Los Angeles County's Chief Executive Office (CEO) and the Department of Public Social Services (DPSS) have maintained the Enterprise Linkages Project (ELP), an integrated data system that collects records of services provided through eight County agencies. The Los Angeles Homeless Services Authority (LAHSA) manages the Homeless Management Information System (HMIS), which includes data on the extent and nature of homeless program use by persons experiencing homelessness throughout most of the County. To explore the potential value of integrating and analyzing data across service delivery systems, the Conrad N. Hilton Foundation funded the first phase of the ELP-HMIS Data Integration Project in collaboration with Los Angeles County's CEO and LAHSA. In this initial phase, data were linked across the two systems and some cursory analysis was conducted of the data match results. The work performed to complete the first phase was guided by three primary questions, each of which is addressed in this report:

1) Can client-level data in Los Angeles County's ELP be linked to client service records in the HMIS?

2) Assuming basic linkages can be established across ELP and HMIS, do the linked data show significant overlaps of people served within the homeless and County mainstream service delivery systems?

3) Do the results suggest it would be beneficial for local planning and program design to conduct ongoing data matches between the two systems and further analysis to determine patterns of County service utilization among clients who have records in HMIS?

Los Angeles County is currently in the process of implementing a number of multi-agency initiatives intended to identify high-priority homeless clients and prioritize them for placement in permanent supportive housing arrangements. These programs include the multi-agency Single Adult Model (SAM), the Department of Mental Health's (DMH's) Countywide Housing, Employment and Education Resources Development program (CHEERD), the LAC+USC Street to Home Project, and the Department of Health Services' Housing for Health program. SAM is already utilizing ELP data to select appropriate clients. Other programs would also benefit considerably from the availability of integrated ELP/HMIS data for purposes of enhancing program practices based on initial experiences and evaluating programmatic effectiveness in terms of client outcomes and cost efficiency.

Additionally, Abt Associates and other key stakeholders in the ELP-HMIS Data Integration Project have expressed interest in conducting an evaluation of the effectiveness of the recently-implemented Coordinated Entry System (CES). In the future, as CES data are incorporated into HMIS, integrated ELP-HMIS data could be used to assess CES' effectiveness and accuracy as a tool in identifying the most vulnerable homeless persons in Los Angeles County. An evaluation of CES would have considerable implications for the provision of homeless services. This is another example of the potential that a systematic integration of ELP and HMIS has to provide policymakers working on homeless issues with the information necessary to craft results-driven practices and programs.

Background on County and HMIS Datasets

The data in ELP
Eight County agencies share data through ELP, five of which are examined in this report:

- **The Department of Mental Health** (DMH) shares data on selected Day and Outpatient services, as well as more limited inpatient and residential services.

- **The Department of Health Services** (DHS) shares data on Emergency Room and inpatient services at County hospitals, as well as outpatient treatment and services funded through Public-Private Partnerships (PPPs), which are typically provided on an outpatient basis but are categorized separately due to their dual funding sources.

- **The Department of Public Health** (DPH) shares data on various services provided through its Substance Abuse Prevention and Control (SAPC) program

- **The Sheriff's Department** shares data on arrests and jail stays.

- **The Department of Public Social Services** (DPSS) shares data on services provided to General Relief (GR) clients.   Additionally, the CEO and DPSS have a long-standing collaborative research relationship through which the CEO's research unit additionally has access to data on CalWORKs clients, including their participation in welfare-to-work program components, CalFRESH (Food Stamps), and SSI advocacy services.

The Three ELP agencies left out of the first phase of the ELP-HMIS Data Integration Project are the departments of Children and Family Services (DCFS) Community and Senior Services (CSS), and Probation. The five County agencies chosen as the focus for the initial phase are those providing services that are of most relevance with respect to homeless policy and have client-level data structures most conducive to large-scale matching. However, future analysis should integrate the data from, at a minimum, the Probation department. Understanding the relationship between the homeless population and the Probation department can serve useful planning purposes, especially considering the recent decision by the Housing Authority for the County of Los Angeles (HACOLA) to modify restrictions on eligibility for housing vouchers among persons with criminal justice involvement.

The data in HMIS
The clients tracked in HMIS receive homeless services through programs funded by LAHSA, the U.S. Department of Housing and Urban Development (HUD), and private funders. These services include emergency shelter, transitional housing programs, and permanent supportive housing programs. A person's inclusion in a cohort of LAHSA records is a reliable indicator that the person experienced homelessness at some point during the four-year period from which the cohort was drawn. However, some of the HMIS observations occur while a person is homeless (e.g., in emergency shelter) and some following an episode of homelessness (e.g., in permanent supportive housing). Furthermore, episodes of homelessness usually do not stretch over a four-year period. Thus, the services recorded in ELP do not necessarily fall at the same time a given client's homeless experience. The ELP services could precede or follow homeless episodes.

Basic information about the *LAHSA Cohort* - that is, clients with records in HMIS over a four-year period - is shown in Table 1. LAHSA agencies provided shelter, housing, or related services to 118,626 different clients between January 2010 and December 2013.

Table 1. The LAHSA Cohort: Size and Basic Demographics

Year	2010		2011		2012		2013		4 Years Combined	
N (unique)	50,864		55,499		54,034		54,168		118,626	
Gender:	#	%	#	%	#	%	#	%	#	%
Male	30,670	60.3	31,990	57.7	31,737	58.7	31,726	58.6	70,123	59.1
Female	20,012	39.3	23,276	41.9	22,051	40.8	22,091	40.8	47,936	40.4
Other	182	0.4	233	0.4	246	0.5	351	0.6	567	0.5
Race	#	%	#	%	#	%	#	%	#	%
African-American	24,123	47.4	27,149	48.9	27,486	50.9	27,049	49.9	56,356	47.5
American Indian	1,747	3.4	1,605	2.9	1,341	2.5	1,307	2.4	3,382	2.9
Asian	935	1.8	967	1.7	932	1.7	876	1.6	1,940	1.6
Pacific Islander	882	1.7	689	1.3	556	1.0	514	1.0	1,581	1.3
White	21,528	42.4	23,104	41.6	22,201	41.1	22,788	42.1	51,275	43.2
Don't know/ refused	1,649	3.3	1,985	3.6	1,518	2.8	1,634	3.0	4,092	3.5
Ethnicity	#	%	#	%	#	%	#	%	#	%
Non-Hispanic	35,172	69.1	38,550	69.4	38,431	71.1	37,969	70.1	81,888	69.0
Hispanic	15,202	30.0	16,258	29.3	15,058	27.9	15,564	28.7	35,460	29.9
Don't know refused	490	0.9	691	1.3	545	1.0	635	1.2	1,278	1.1

Findings

Can client-level data in Los Angeles County's ELP be linked to client service records in the HMIS?

The most basic goal guiding the first phase of the ELP-HMIS Data Integration Project was to establish linkages between client records in HMIS and ELP covering the period from 2010 through 2013. The CEO's Research and Evaluation Services unit (RES) has successfully used a matching methodology in the past with other datasets, which was used again for the matches summarized here. The results were successful, and a matched dataset was created for each of the five agencies described above.

Based on a Memorandum of Understanding (MOU) between the two agencies, LAHSA supplied the CEO with HMIS files that compiled all LAHSA clients and the services these clients received over the four-year study period. The basic client files, containing all persons who received services through LAHSA over the study period, served as the cohort files matched against records of services provided by the County agencies.

In keeping with the terms governing the transfer of data from LAHSA to the CEO, RES was barred from working with identifiable data for anything other than the purpose of encrypting and de-identifying the HMIS records. This required the RES analysts to travel to LAHSA and encrypt the cohort file on site, under the supervision of a LAHSA data manager. The analysts left the premises with nothing more than encrypted cohort files and additional files LAHSA provided that did not contain identifiable information. The process was completed in this manner because linkages between de-identified records in ELP and HMIS could not be established unless the data in each system were encrypted with the same encryption

software and logic. If LAHSA were to become a participant in ELP, the monthly encryption of HMIS records could be expected to occur remotely and be completed more quickly as part of the normal ELP data integration routines.

The data matching methodology used to link records in ELP and HMIS established common clients across the two systems in ten cycles for each of the five County agencies examined in this report. Each cycle is designed to identify common clients on given combinations of identifiers with varying degrees of exactitude. Once clients are linked based on the combinations in a given cycle, they are removed from the cohort file and placed into a match file. Cycles that allow for inexact ('fuzzy') matches – such as matches in which all elements match except for reversed digits in a Social Security number – are based on probabilistic principles. The ELP record linkage process is therefore a highly accurate but inexact science. The cycles and combinations of identifying variables used to establish linkages across data sets (also ordered based on probabilistic assumptions) are shown in Table 2.

Table 2. The Variable Combinations for ELP's 10-Cycle Data Match Methodology

Cycle	Variable Combinations
1	SSN + First Name
2	SSN + DOB + Last Name + Gender
3	Last Name + First Name + DOB (fuzzy) + SSN (fuzzy);
4	Last Name + First Name (reversed) + DOB (fuzzy) + SSN (fuzzy);
5	Last Name + First Name + DOB + Address Street and House Number;
6	Last Name + First Name + DOB + Address Street and House Number:
7	Last Name + First Name + Gender + DOB + Middle Initial;
8	First Name + Middle Initial + Gender + DOB + Address Street and House Number;
9	Last Name + First Name + Gender + DOB (fuzzy) + Address Street and House Number;
10	Last Name + First Name + Gender + DOB (fuzzy) + Address Street and House Number.

No major technical issues were encountered in linking HMIS data to administrative records from five County agencies. From the standpoint of data compatibility, then, the exploratory analyses indicate that inclusion of HMIS in ELP data sharing arrangements – i.e. a permanent integration of the data in the two systems - would be relatively uncomplicated given the proper legal framework and necessary fiscal and administrative resources.

Do the linked data show significant overlaps?

As expected, there were significant overlaps between LAHSA clients and the clients of each matched agency, ranging from 4 to 30 percent annually and from 10 to almost 50 percent for the full four-year observation period. The preliminary matching was conducted by year. Matches were made by looking first within each year to determine if there was a LAHSA service interaction and an ELP agency service interaction within the same calendar year. Then the same analysis was conducted across the entire four-year analysis period. So, for a client with a LAHSA service interaction in 2010 and DHS service interaction in 2012, as illustrated below, no match would be created in any individual calendar year, but a match would be shown for the four-year unique total.

Table 3 shows the number and percent of the LAHSA cohort who matched each of the agencies from each calendar year and over the full four-year study period.

Table 3. Overall Match Rates for Clients Receiving Services through LAHSA, 2010-2013.

Year	LAHSA clients	LAHSA/ DMH clients		LAHSA/ DHS clients		LAHSA/ DPH clients		LAHSA/ Sheriff clients		LAHSA/ DPSS clients	
		#	%*	#	%	#	%	#	%	#	%
2010	50,864	4,598	9.0	14,999	29.5	2,435	4.8	4,386	8.6	3,664	7.2
2011	55,499	3,789	6.8	10,052	18.1	2,172	3.9	4,170	7.5	3,149	5.7
2012	54,034	3,567	6.6	8,509	15.7	2,456	4.5	3,369	6.2	3,702	6.9
2013	54,168	5,757	10.6	14,774	27.3	2,034	3.8	3,515	6.5	6,069	11.2
4-yr total	**118,626**	**18,244**	**15.4**	**56,557**	**46.7**	**11,289**	**9.5**	**19,695**	**16.6**	**18,229**	**15.4**

*Percent of the LAHSA cohort clients also served by the ELP agency during the period

An overview of the client overlap overall and by service type for each county agency is presented in the appendix to this report.

Do the results suggest it would be beneficial for local planning or program design to conduct ongoing matching between the two systems and further analysis?

The match rates show that data linked across ELP and HMIS could be used to reveal de-identified information about high-utilizers of County services, the costs of providing them with services, and the possible impact of making subsidized housing available to the most frequent users of resource-intensive services. Some preliminary test analyses were conducted on the matched dataset. These test cases are described in the following sections, along with additional analyses suggested by the preliminary results that may be useful to pursue in future work. In particular, two avenues of exploration are described: deeper analysis of the timing of client homeless episodes in relation to County service interactions and the differences in County service utilization among subpopulations within the LAHSA cohort.

Relative timing of service interactions

As described above, not all service interactions with the ELP agencies included occur within the same year as the LAHSA service interaction, suggesting that at least some proportion of the clients may have unrelated interactions between multiple systems. For example, an individual in subsidized housing may have been arrested in 2010, and only several years later become homeless and stayed in an emergency shelter. Ultimately, it will be critical to establish some parameters, which may vary by agency, depending on the nature of the service.

Two test analyses related to timing were conducted as part of the preliminary matching process. First, Table 4 shows the number of services captured in ELP and used by the LAHSA cohort in each calendar year and then across the four- year period.

Table 4. Number of County Services Received by LAHSA Clients, 2010–2013

Year	Services Received by LAHSA Clients				
	DMH services	DHS services	DPH services	Jail stays (Sheriff)	GR starts (DPSS)
2010	37,746	30,396	3,352	10,622	3,867
2011	48,459	26,370	2,903	9,562	3,390
2012	35,583	20,752	3,310	8,995	4,029
2013	76,988	50,903	2,827	17,146	6,694
4-yr unique total	763,898	377,945	21,501	106,951	39,599
% used in years other than LAHSA services	74.0%	66.0%	42.4%	56.7%	54.6%

The four-year totals are considerably larger than the totals for any one year. In particular, the results indicate that a significant proportion of the LAHSA cohort's utilization of DHS and DMH services took place in years when clients were not engaged with LAHSA and HUD. In terms of especially expensive services widely understood to be the main drivers of the public cost of homelessness, 66 percent of the cohort's use of DHS services (including emergency room and inpatient services) and 57 percent of its jail stays took place in years when clients were not receiving services through LAHSA. In addition, forty-two percent of the DPH services used by the four-year cohort were consumed in years when clients were not engaged with LAHSA. More information is needed, however, to determine if the interactions preceded or followed the clients' homeless experience.

An additional test analysis was conducted to determine the feasibility of using linked data to gain a more nuanced understanding of the relationship between receipt of the homeless assistance captured in HMIS and use of County services. The test case was the timing of the relationship between the use of permanent supportive housing (PSH) in the LAHSA file and DHS service use in ELP.

Data on PSH placements were made available in supplemental files provided by LAHSA. A total of 7,399 of the 74,477 single adults in the LAHSA four-year cohort (9.9%) were placed into PSH over the observation period. Almost all of these persons placed in PSH (7,336, or 99%) used County services over this period.

Table 5 shows DHS services used by single adults who were placed in PSH and parses the service episodes by whether they occurred before or after the client's entry to a PSH project. This preliminary analysis suggests that emergency room use declined by 11% after placement in housing. However, this likely *understates* the extent of the decline among the PSH subgroup since the mean amount of time observed after their placement in housing was three times longer than the mean amount of time before placement.

Additionally, both inpatient and outpatient health visits appear to have increased after placement. However, similarly to what is observed with emergency room episodes, this likely *overstates* the increase in utilization since the mean amount of time patients in the PSH subgroup were observed after placement was about 3.5 times longer than the amount of time observed before placement.

Table 5. DHS Service Episodes for LAHSA Single Adult PSH Clients, 2010–2013

DHS Service Type	Total Episodes for PSH Clients	Episodes Before Entry into Housing		Episodes After Entry into Housing	
		#	% Episodes Overall	#	% Episodes Overall
Emergency	10,257	5,423	52.90	4,834	47.10
Inpatient	1,915	886	46.20	1,029	53.80
Outpatient	37,304	15,403	41.30	21,901	58.70
Total	64,562	29,410	45.60	35,152	54.40

Significant further analysis would be needed to more fully understand each client's homeless experience. For example, it is not clear in this example whether all the time preceding the client's placement in housing was spent homeless. Additional ELP agencies could be included in the analysis, and ELP data could be used for a cost analysis pre- and post-placement in PSH. It would be most illustrative to look at the differences pre- and post-placement for those clients who were most intensively using emergency or high-cost inpatient services during periods of homelessness or who have extended periods of homelessness. It should also be emphasized that conducting time-sensitive analysis for purposes other than demonstration would require the use of more sophisticated time-to-event statistical methods that control for uneven pre/post periods of observation.

Rates by Subpopulations among LAHSA Clients
The matched dataset provides an opportunity for understanding service utilization among different groups of LAHSA and County clients. Future analysis could explore County service utilization among chronically-homeless individuals with extended periods of homelessness. It would also be possible to identify the highest users of costly County services and analyze their homeless experiences to determine if there are opportunities for engaging them in more appropriate housing interventions. The preliminary analysis suggests that identifying subpopulations among the LAHSA dataset is possible, even without accessing personally identifying information.

In a refinement to the original dataset, LAHSA was able to provide a data flag to indicate whether clients were adults at the time of each entry into a LAHSA service. In this way, adult and minor clients were flagged as such without reference to restricted dates of birth. Table 6 presents the proportion of adults and single adults who were served by LAHSA between 2010 and 2013 and shows the extent to which these subpopulations used *any* services provided through any of the five analyzed County agencies over the four-year observation period. In all, among single adult clients, 83 percent had some service interaction with County agencies. Among adult clients, a significant portion of the service interactions were related to receipt of GR benefits through DPSS or arrests made by the Sheriff's Department rather than receipt of supportive services through DMH, DHS, or DPH.

Table 6. Overall Match Rate for Adult and Single Adult Clients, 2010–2013

2010–2013	County Client Group	# LAHSA Clients	% of LAHSA Clients Using Services
LAHSA Adult Clients (N= 100,452)	Used any County services	72,971	72.60
	Used any County services (except Sheriff & GR)	49,525	49.30
LAHSA Single Adult Clients (N= 74,477)	Used any County services	61,649	82.80

LAHSA additionally provided data elements that made it possible to analyze clients who were flagged in HMIS as persons experiencing chronic homelessness. Table 7 shows County service utilization among the 11,815 adults who were categorized as chronically homeless in at least one of their 2013 HMIS service records. The results presented in the table demonstrate that the linked data enable analysis by individual year as well as for the full four-year study period. The 2013 chronically-homeless adult subgroup constituted roughly 27% of the adults LAHSA served in 2013 and 22% of LAHSA's total client population for the year.

Table 7. County Service Use among Chronically-Homeless Adult LAHSA Clients, 201

	DHS	DMH	DPH	Sheriff*	DPSS/GR
Chronically-Homeless Adults	5,879	1,958	804	1,302	1,832
% 2013 Chronically-Homeless Adults, n= 11,815	49.8	16.6	6.8	11.0	15.5
% 2013 Adult Clients, n=44,365	13.3	4.4	1.8	2.9	4.1
% 2013 LAHSA Clients Overall, n= 54,168	10.9	3.6	1.5	2.4	3.4

*These are counts of clients arrested by the Sheriff's Department in 2013. Among these clients, 1,102 (91.6%) were held in a County jail facility and 340 (26.1%) were re-arrested in 2013.

In the future, LAHSA could also provide a similar indicator to identify individuals who are Transition Age Youth (i.e. those who are ages 18-24), or veterans at the time of their entry into LAHSA programs. With this information, service histories could be analyzed for these high-need subpopulations that are being prioritized for permanent housing resources.

High-Volume Users of County Services

Linked data could also be used to identify high-volume users of County services who experience homelessness. As shown in Table 8, preliminary analysis suggests that there is considerable overlap between clients who use a large number of County services and those who are in the LAHSA cohort. Clients using five or more services in a year (2 or more for DPH SAPC services), or 20 services in four years , are categorized here as high-volume users.

Table 8. Percentage of LAHSA Cohort who are High-Volume Users by Agency, 2010–2013

Year	Percentage of LAHSA/ DMH Cohort using 5+ DMH Services	Percentage of LAHSA/ DHS Cohort using 5+ DHS Services	Percentage of LAHSA/ DPH Cohort using 2+ DPH Services	Percentage of LAHSA/ Sheriff Cohort who have been Arrested 5+ Times
2010	21.4%	6.8%	10.0%	26.7%
2011	32.8%	11.1%	9.1%	31.2%
2012	34.4%	9.8%	10.0%	30.5%
2013	55.9%	16.0%	10.0%	63.0%
4-yr unique total*	41.0%	7.2%	0.9%	33.1%

Data integrated across ELP and HMIS could be used to develop a data-driven and service-specific definition of heavy utilization, ideally one closely related to specific eligibility criteria established for the SAM, Housing for Health, CHEERD, or the CES. Such a methodology, if developed in partnership with appropriate partner agencies, could be used on an ongoing basis to identify high utilizers of County services who may be appropriate for resource-intensive LAHSA interventions. An analysis of this kind presupposes further integration of records in ELP and HMIS, including the ongoing transfer and use of personally identifiable information in circumstances in which access to such information is legally authorized.

Next Steps

The data elements in ELP and HMIS are compatible, which means that a critical piece of the technical groundwork for integrating the records in each system is in place. Alongside the compatibility of data across ELP and HMIS, the substantive results of the data matches collectively make a powerful case for the integration of the records in the two systems and the creation of a permanent infrastructure for routinely-updated, multidisciplinary data on Los Angeles County's homeless population. Regularly integrated ELP/HMIS data would provide a mechanism to inform policies and programs that are effective in ending cycles of chronic homelessness and efficient in the deployment of limited public resources.

In an effort to champion this ongoing integration, the CEO, LAHSA, and Abt Associates will work collaboratively to implement the following immediate next steps:

- The CEO and Abt will work together to vet these preliminary findings with LAHSA, DMH, DHS, DPH, Sheriff's Department, and DPSS to determine if the reported results are consistent with what is known about the client populations at each agency. Any inconsistencies will be examined and corrective actions taken as needed.

- The CEO and Abt will convene a meeting of representatives from CEO, LAHSA, the County agencies currently participating in ELP, and researchers working on homeless issues within Los Angeles, for the purpose of building consensus on the addition of LAHSA to the ELP data sharing arrangements, the development of an ELP-HMIS data integration project plan, budget, timetable and estimate of return on investment; identifying and refining potential research questions; and identifying and engaging potential funders. As part of this process, the CEO and LAHSA will work together, with technical assistance from Abt, to explore the possibility of establishing an agreement between LAHSA and the CEO that specifies the requirement that the CEO will deliver matched, de-identified analysis files for the 2010–2013 cohort to LAHSA, along with variable descriptions. In the event that ongoing, regularly scheduled matches are successfully established, the amended agreement would specify delivery of an updated analysis file at the time of each match.

- LAHSA and the CEO will work collectively to seek support for the ongoing merger and subsequent research projects.

- The MOU establishing the data sharing arrangement for the exploratory ELP-HMIS is valid through 2019. Under the terms of the MOA, LAHSA will make de-identified HMIS data files available to the CEO's research unit on a quarterly basis for purposes of analysis and programs evaluation. In turn – and provided the County agencies in ELP raise no objections - the CEO's research unit will provide LAHSA with biannual reports on patterns of County service utilization within LAHSA's client population. These reports will be customized to address questions of particular interest to LAHSA and other agencies working issues related to the County's homeless population.
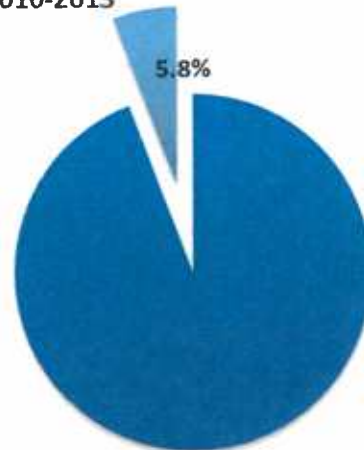
Appendix:

Match Results

Department of Mental Health (DMH)

DMH Service Use Among LAHSA Clients, 2010-2013

15.4%
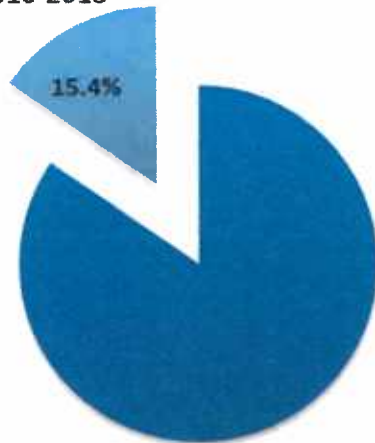
Total LAHSA Cohort: 118,626

LAHSA Service Use Among DMH Clients, 2010-2013

5.8%

Total DMH Cohort: 313,463

	# LAHSA Clients in Cohort	# DMH Services Used	# Cohort Clients Using DMH Services	% of Cohort Using DMH Services	Average # Services: LAHSA Client (:1)	# Clients Using 5+ Services
HMIS Cohort Annual Utilization of DMH Services*						
Year						
2010	50,864	37,746	4,598	9.0	8.2	982
2011	55,499	48,459	3,789	6.8	12.8	1,241
2012	54,034	35,583	3,567	6.6	10.0	1,227
2013	54,168	76,988	5,757	10.6	13.4	3,216
4 Years Total	**118,626**	**763,898**	**18,244**	**15.4**	**42.0**	**7,482***

* ELP captures a significant but non-exhaustive portion of DMH's monthly Outpatient and Day service episodes and smaller proportions of inpatient and residential services.

*This four-year total is a count of clients who used 20+ DMH services over the four year study period.

Observations

- Approximately 15 percent of the LAHSA cohort utilized DMH service captured in ELP at some point during the study period, and the majority of these services were recurrent forms of outpatient treatment.

- While the number and proportion of annual LAHSA cohort clients using these DMH services dipped between 2010 and 2011, the total number of services used during that time period increased by roughly 28 percent, but then fell to the lowest level of the study period in 2012 before increasing by more than 116 percent in 2013.

	% Cohort Clients Using Day Services*	% Cohort Using Outpatient Services*
DMH Service Use, by Service Type+		
Year		
2010	1.0	8.0
2011	1.3	6.0
2012	1.0	5.7
2013	1.4	8.7
4 Years Total	**3.7**	**14.1**

+99,898 of the 763,898 mental service records counted over the four-year period (13%) were missing information on service type.

* These percentages are calculated by using the total LAHSA client count for the year as the denominator. E.g. the denominator for 2010 is 50,864.
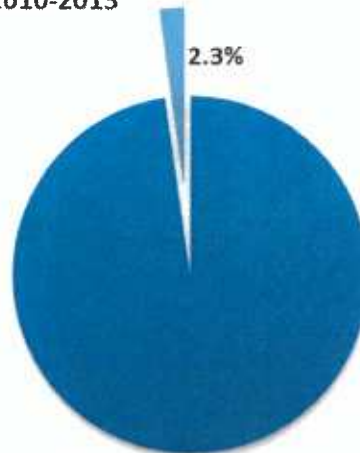
Department of Health Services (DHS)

DHS Service Use Among LAHSA Clients, 2010-2013
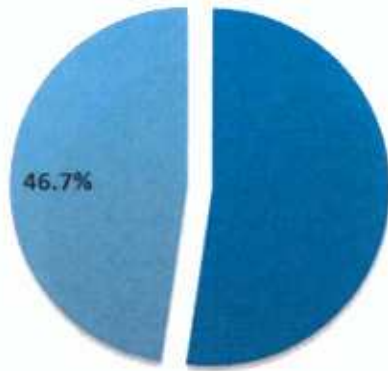
Total LAHSA Cohort: 118,626

LAHSA Service Use Among DHS Clients, 2010-2013

Total DHS Cohort: 2,548,042

HMIS Cohort Annual Utilization of DHS Services

Year	# LAHSA Clients in Cohort	# DHS Services Used	# Cohort Clients Using DHS Services	% of Cohort Using DHS Services	Average # Services: LAHSA Client (:1)	# Clients Using 5+ Services
2010	50,864	30,396	14,999	29.5	2.0	1,017
2011	55,499	26,370	10,052	18.1	2.6	1,113
2012	54,034	20,752	8,509	15.7	2.4	834
2013	54,168	50,903	14,774	27.3	3.4	2,366
4 Years Total	118,626	377,945	56,557	46.7	6.7	4,100*

This four-year total is a count of clients who used 20+ DHS services over the four year study period.

DHS Service Use, by Service Type

| Year	% Cohort Clients Using Emergency Services*	% Cohort Clients Using Inpatient Services*	% Cohort Using Outpatient Services*	% Cohort Clients Using Public-Private Partnership Services*
2010	10.5	1.0	8.0	8.7
2011	6.5	1.3	6.0	5.6
2012	6.5	1.0	5.7	4.3
2013	10.4	1.4	8.7	10.1
4 Years Total	22.7	3.7	14.1	16.7

* These percentages are calculated by using the total LAHSA client count for the year as the denominator. E.g. the denominator for 2010 is 50,864.

Observations

- Almost half of the four-year LAHSA cohort used DHS services at some point between 2010 and 2013. More specifically, more than 1 in 5 clients used DHS emergency services, and 1 in 14 was hospitalized.

- The number of heavy utilizers spiked from 834 in 2012 to 2,366 in 2013, an increase of roughly 284 percent. The explanation for the sharp increase is unknown as of this writing but may be related to Health Care reform legislation.
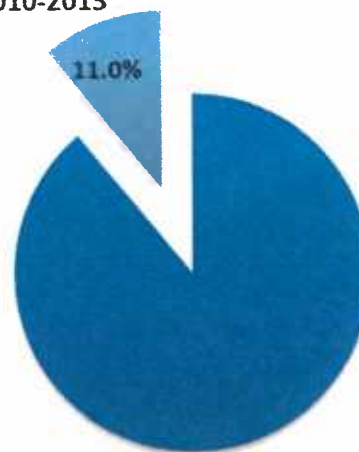
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Department of Public Health (DPH)
Substance Abuse Prevention and Control Program (SAPC)

DPH Service Use Among LAHSA Clients, 2010-2013

9.5%
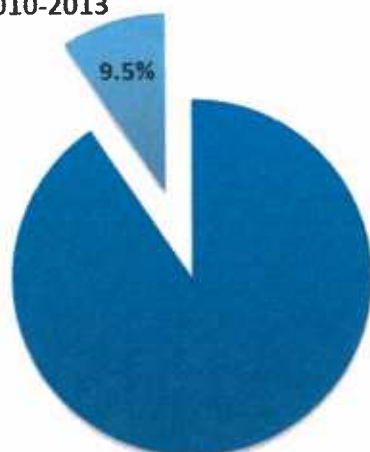
Total LAHSA Cohort: 118,626

LAHSA Service Use Among DPH Clients, 2010-2013

11.0%

Total DPH Cohort: 102,247

HMIS Cohort Annual Utilization of DPH Services

Year	# LAHSA Clients in Cohort	# DPH Services Used	# Cohort Clients Using DPH Services	% of Cohort Using DPH Services	Average # Services: LAHSA Client (:1)	# Clients Using 2+ Services
2010	50,864	3,352	2,435	4.8	1.5	243
2011	55,499	2,903	2,172	3.9	1.3	197
2012	54,034	3,310	2,456	4.5	1.3	245
2013	54,168	2,827	2,034	3.8	1.4	204
4 Years Total	118,626	21,501	11,289	9.5	1.9	101*

This four-year total is a count of clients who used 8+ DPH services over the four year study period.

DPH Service Use, by Service Type

| Year	% of Cohort Clients Using Narcotic Treatment and Detox Services*	% Cohort Clients Using Outpatient Services*	% Cohort Clients Using Residential Services*	% Clients Using Day Care Habilitative Services*
2010	1.2	2.3	1.8	<1.0
2011	1.0	2.1	1.3	<1.0
2012	1.1	2.4	1.4	<1.0
2013	1.0	1.9	1.3	<1.0
4 Years Total	2.6	5.4	3.7	<1.0

* These percentages are calculated by using the total LAHSA client count for the year as the denominator. E.g. the denominator for 2010 is 50,864.

Observations

- Slightly less than 1 in 10 cohort clients used substance abuse services provided by DPH SAPC program over the full observation period.

- Outpatient services comprised 44 percent of the total substance abuse services used by the LAHSA cohort over the four years observed, residential services comprised 28 percent, and narcotic treatment and detox services comprised 24 percent.
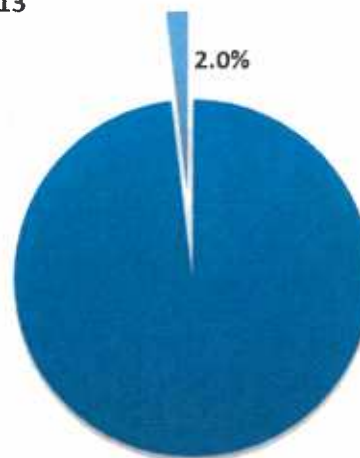
Sheriff's Department

Arrestees Among LAHSA Clients, 2010-2013

16.6%
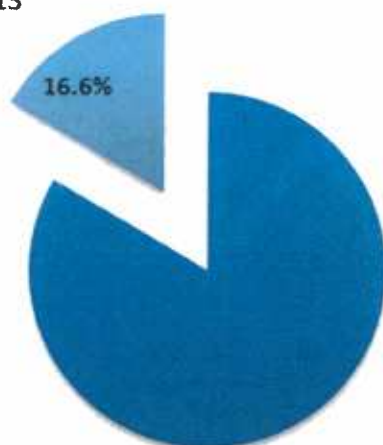
Total LAHSA Cohort: 118,626

LAHSA Service Use Among Arrestees, 2010-2013

2.0%

Total Sheriff Cohort: 994,760

HMIS Cohort Annual Arrests and Jail Stays

Year	# LAHSA Clients in Cohort	# Cohort Arrests	# Cohort Clients Arrested	% of Cohort Arrested	Ratio Arrests: Clients (:1)	# Clients Arrested 5+Times
2010	50,864	27,162	4,386	8.6	6.2	1,171
2011	55,499	27,501	4,170	7.5	6.6	1,301
2012	54,034	20,489	3,369	6.2	6.1	1,029
2013	54,168	42,549	3,515	6.5	12.1	2,215
4 Years Total	118,626	412,475	19,695	16.6	20.9	6,523*

*This four-year total is a count of clients arrested 20+ times over the four year study period.

Observations

- The number of LAHSA cohort arrests declined by more than 25% between 2011 and 2012 but then more than doubled between 2012 and 2013. This trend was accompanied by a commensurate increase in the ratio of arrests per client from 6 to 12, which is consistent with the increase in clients re-arrested over this period, from 54 percent to 83 percent. Whether these fluctuations are related to the passage in 2011 of Assembly Bill 109, Public Safety Realignment, is not known as of this writing.

### Jail Stays and Re-arrest Rates Among Cohort Arrestees

Year	% of Arrested Cohort Clients w/Jail Stays*	% Cohort Clients Re-Arrested**
2010	78.7	51.4
2011	65.6	53.6
2012	72.8	53.5
2013	83.7	82.6
4 Years Total	93.5	95.3

* These percentages are calculated by using the total arrest cohort for the year as the denominator. E.g. the denominator for 2010 is 4,386.

+Re-arrests are all arrests in a given year that come after a client's initial arrest in the same year. Re-arrests for the four years as a whole are all arrests after the initial arrest in the study period.
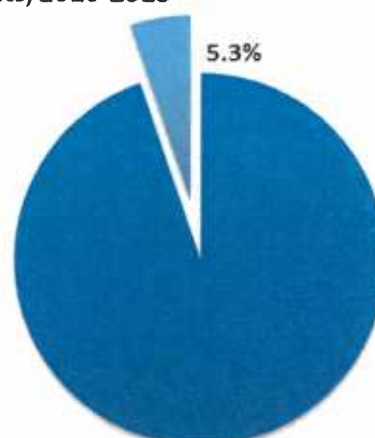
Department of Public Social Services

LAHSA Clients with GR Starts, 2010-2013

15.4%
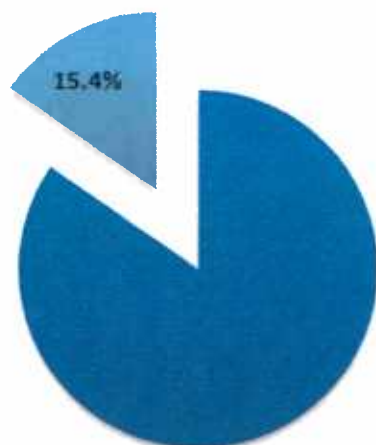
Total LAHSA Cohort: 118,626

LAHSA Service Use Among GR Recipients, 2010-2013

5.3%

Total GR Cohort: 345,552

HMIS Cohort New GR Starts and Employability Status

Year	# LAHSA Clients in Cohort	Annual # New GR Starts	Annual # of Cohort Clients with a New GR Start	% of Cohort with a New GR Start	# Clients with No Months of Employable Status*	% of Cohort GR Recipients with No Months of Employable Status
2010	50,864	3,867	3,664	7.2	1,546	42.2
2011	55,499	3,390	3,149	5.7	1,284	40.8
2012	54,034	4,029	3,702	6.9	1,524	41.2
2013	54,168	6,694	6,069	11.2	2,366	39.0
4 Years Total	118,626	39,599	18,229	15.4	10,018	55.0

* DPSS assigns a periodically-updated employability status to all clients receiving GR. The employability statuses and their coding in DPSS LEADER data are as follows: "Employable" ("E"); Unemployable ("U"); Permanently Unemployable (P); Needs Special Assistance ("NSA"); and Administratively Unemployable (A). We collapsed all statuses other than "Employable" into a single categorization of "no months of employable status".

Observations

- While the overall GR caseload in the County fell by 6 percent between 2012 and 2013, the number of LAHSA clients who initiated new periods of GR receipt grew from 3,702 to 6,069, an increase of 69 percent. This raises the question of whether LAHSA has been involved in the provision of services to assist clients in gaining eligibility for income benefits such as GR, SSI, CalWORKs, and CalFRESH (food stamps).

- Among LAHSA clients with new periods of GR receipt in any of the four years in the study period, most only have one new GR start per year. This is to be expected since (1) employable GR recipients can receive cash benefits for nine consecutive months in the period of a year, (2) unemployable recipients are not time limited and receive cash aid for as long as they can demonstrate that their disabilities prevent them from working, and (3) a transition from employable to unemployable status within the GR program stops the nine-month clock for consecutive months of cash assistance. However, the results also suggest that LAHSA clients do not generally experience interruptions in receipt of aid due to sanctions for noncompliance with GR program requirements, which might otherwise cause them to cycle on and off assistance.

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